

What is claimed is:

5 *Sub 9* 1. Abrasive particle comprising at least 60.0 percent by weight sintered, polycrystalline zirconia, based on a total weight of the abrasive particle.

2. The abrasive particle of Claim 1, wherein the particle comprises at least 65.0 percent by weight sintered, polycrystalline zirconia, based on the total weight of the abrasive particle.

10 3. The abrasive particle of Claim 1, wherein the particle comprises at least 70.0 percent by weight sintered, polycrystalline zirconia, based on the total weight of the abrasive particle.

15 4. The abrasive particle of Claim 1, wherein the particle comprises at least 75.0 percent by weight sintered, polycrystalline zirconia, based on the total weight of the abrasive particle.

20 5. The abrasive particle of Claim 1, wherein the particle comprises at least 80.0 percent by weight sintered, polycrystalline zirconia, based on the total weight of the abrasive particle.

25 6. The abrasive particle of Claim 1, wherein the particle comprises at least 85.0 percent by weight sintered, polycrystalline zirconia, based on the total weight of the abrasive particle.

7. The abrasive particle of Claim 1, wherein the particle comprises at least 90.0 percent by weight sintered, polycrystalline zirconia, based on the total weight of the abrasive particle.

30 8. The abrasive particle of Claim 1, wherein the sintered, polycrystalline zirconia is at least partially stabilized.

35 9. The abrasive particle of Claim 8, wherein the particle further comprises a stabilizing metal oxide in an amount of up to about 14.0 percent by weight, based on the total weight of the abrasive particle.

10. The abrasive particle of Claim 9, wherein the particle comprises from about 86.0 to about 97.0 percent by weight of the sintered, polycrystalline zirconia; and from about 14.0 to about 3.0 percent by weight of the stabilizing metal oxide, based on the total weight of the abrasive particle.

11. The abrasive particle of Claim 8, wherein the sintered, polycrystalline zirconia is at least partially stabilized with a stabilizing metal oxide selected from the group consisting of calcium oxide, magnesium oxide, cerium oxide, yttrium oxide, gadolinium oxide, ytterbium oxide, neodymium oxide, terbium oxide, praseodymium oxide, dysprosium oxide, holmium oxide, samarium oxide, scandium oxide, lanthanum oxide, promethium oxide, europium oxide, erbium oxide, thulium oxide, lutetium oxide, titanium oxide, germanium oxide, iron oxide, copper oxide, zinc oxide, yttrium-niobium oxide, yttrium-tantalum oxide, and combinations thereof.

12. The abrasive particle of Claim 1, wherein the abrasive particle further comprises up to 40.0 percent by weight of at least one non-stabilizing metal oxides, based on the total weight of the abrasive particle.

13. The abrasive particle of Claim 1, wherein the abrasive particle further comprises up to 40.0 percent by weight of at least one metal oxide selected from the group consisting of aluminum oxide, hafnium oxide, silicon oxide, iron oxide, calcium oxide, sodium oxide, magnesium oxide, rare earth oxides, yttrium oxide, titanium oxide, nickel oxide, and combinations thereof.

14. The abrasive particle of Claim 1, wherein the abrasive particle further comprises up to 40.0 percent by weight of aluminum oxide, based on the total weight of the abrasive particle.

15. The abrasive particle of Claim 1, wherein the abrasive particle comprises at least 60.0 to about 97.0 percent by weight of the sintered, polycrystalline zirconia, from 0 to about 37.0 weight percent aluminum oxide, and from about 3.0 to about 8.0 weight percent of yttrium oxide, based on the total weight of the abrasive particle.

16. The abrasive particle of Claim 1, wherein the abrasive particle comprises at least 60.0 to about 97.0 percent by weight of the sintered, polycrystalline zirconia, from about 3.0 to about 8.0 weight percent of stabilizing yttrium oxide, from 0 to about 37.0 weight percent of aluminum oxide, and from 0 to about 10.0 weight percent of a second, non-stabilizing metal oxide, based on the total weight of the abrasive particle.

17. The abrasive particle of Claim 16, wherein the second, non-stabilizing metal oxide comprises lanthanum oxide, cerium oxide, praseodymium oxide, neodymium oxide, samarium oxide, europium oxide, gadolinium oxide, or combinations thereof.

18. The abrasive particle of Claim 1, wherein at least 50.0 percent of the zirconia has a tetragonal crystalline structure.

19. The abrasive particle of Claim 18, wherein at least 80.0 percent of the zirconia has a tetragonal crystalline structure.

20. The abrasive particle of Claim 19, wherein at least 90.0 percent of the zirconia has a tetragonal crystalline structure.

21. The abrasive particle of Claim 1, wherein the zirconia has an average crystal size of less than about 3 micrometers.

22. The abrasive particle of Claim 1, wherein the zirconia has an average crystal size of less than about 1 micrometer.

23. The abrasive particle of Claim 1, wherein the zirconia has an average crystal size of not greater than 0.5 micrometer.

24. The abrasive particle of Claim 1, wherein the abrasive particle has a specific density of at least 95.0 percent of theoretical density.

25. A plurality of abrasive particles having a particle size distribution ranging from fine to coarse, wherein at least a portion of the plurality of abrasive particles are abrasive particles comprising at least 60.0 percent by weight sintered, polycrystalline zirconia, based on a total weight of a given abrasive particle.

26. The plurality of abrasive particles of Claim 25, wherein the plurality of abrasive particles further comprises other abrasive particles.

27. A plurality of abrasive particles having a particle size distribution ranging from fine to coarse and a specified nominal grade, wherein at least a portion of the plurality of abrasive particles are abrasive particles comprising at least 60.0 percent by weight sintered, polycrystalline zirconia, based on a total weight of a given abrasive particle.

28. The plurality of abrasive particles according to Claim 27 wherein said specified nominal grade is selected from the group consisting of ANSI 16, ANSI 24, ANSI 36, ANSI 40, ANSI 50, ANSI 60, ANSI 80, ANSI 100, ANSI 120, ANSI 150, ANSI 180, ANSI 220, ANSI 240, ANSI 280, ANSI 320, ANSI 360, ANSI 400, and ANSI 600.

29. The plurality of abrasive particles according to Claim 27 wherein said specified nominal grade is selected from the group consisting of P16, P24, P36, P40, P50, P60, P80, P100, P120, P150, P180, P220, P320, P400, P500, P600, P800, P1000, and P1200.

30. The plurality of abrasive particles according to claim 27 wherein said specified nominal grade is selected from the group consisting of JIS16, JIS24, JIS36, JIS46, JIS54, JIS60, JIS80, JIS100, JIS150, JIS180, JIS220, JIS240, JIS280, JIS320, JIS360, JIS400, JIS600, JIS800, JIS1000, JIS1500, JIS2500, JIS4000, JIS6000, JIS8000, and JIS10,000.

31. An abrasive article comprising a binder and a plurality of abrasive particles, wherein at least a portion of the abrasive particles are abrasive particles comprising at least 60.0 percent by weight sintered, polycrystalline zirconia, based on a total weight of a given abrasive particle.

32. An abrasive article comprising a backing, a binder, and a plurality of abrasive particles; wherein at least a portion of the abrasive particles are abrasive particles comprising at least 60.0 percent by weight sintered, polycrystalline zirconia, based on a total weight of a given abrasive particle.

33. A method of making an abrasive particle, the method comprising:
heating an abrasive particle precursor to provide an abrasive particle
comprising at least 60.0 percent by weight polycrystalline zirconia, based on a total weight
of the abrasive particle, wherein the heating is conducted below a melting point of the
abrasive particle.

34. The method of Claim 33, wherein the zirconia is at least partially
stabilized.

35. The method of Claim 33, wherein the abrasive particle further comprises
up to 40.0 percent by weight of at least one non-stabilizing metal oxides, based on the total
weight of the abrasive particle.

36. The method of Claim 33, wherein the abrasive particle further comprises
up to 40.0 percent by weight of aluminum oxide, based on the total weight of the abrasive
particle.

37. The method of Claim 33, wherein the abrasive particle further comprises
a stabilizing metal oxide in an amount of up to about 14.0 percent by weight, based on the
total weight of the abrasive particle.

38. The method of Claim 37, wherein the abrasive particle comprises from
about 86.0 to about 97.0 percent by weight of the polycrystalline zirconia; and from about
14.0 to about 3.0 percent by weight of the stabilizing metal oxide, based on the total
weight of the abrasive particle.

39. The method of Claim 37, wherein the abrasive particle comprises at least
60 to about 97 percent by weight polycrystalline zirconia, from 0 to about 37.0 weight
percent aluminum oxide, and from about 3 to about 8 weight percent yttrium oxide, based
on the total weight of the abrasive particle.

40. The method of Claim 37, wherein the abrasive particle comprises at least
60.0 to about 97.0 percent by weight of the sintered, polycrystalline zirconia, from about
3.0 to about 8.0 weight percent of stabilizing yttrium oxide, from 0 to about 37.0 weight
percent of aluminum oxide, and from 0 to about 10.0 weight percent of a second, non-
stabilizing metal oxide, based on the total weight of the abrasive particle.

41. The method of Claim 40, wherein the second, non-stabilizing metal oxide comprises lanthanum oxide, cerium oxide, praseodymium oxide, neodymium oxide, samarium oxide, europium oxide, gadolinium oxide, or combinations thereof.

42. The method of Claim 37, wherein the abrasive particle is sintered at at least one temperature in the range of about 1300°C to about 1550°C.

43. An abrasive article comprising binder material and a plurality of abrasive particles, wherein at least a portion of the abrasive particles are abrasive particles comprising at least 60.0 percent by weight of sintered, polycrystalline zirconia, based on a total weight of a given abrasive particle.

44. The abrasive article of Claim 43, wherein the article is a coated abrasive article, and further comprises a backing.

45. The abrasive article of Claim 43, wherein the article is a bonded abrasive article.

46. The abrasive article of Claim 43, wherein the article is a nonwoven abrasive article, and further comprises a nonwoven web.

47. The abrasive article of Claim 43, wherein the article is a brush.

48. A method of abrading a surface, said method comprising:
contacting at least one abrasive particle comprising at least 60.0 percent by weight sintered, polycrystalline zirconia, based on a total weight of the abrasive particle, with a surface of a workpiece; and
moving at least one of said abrasive particle or said surface relative to the other to abrade at least a portion of said surface with said abrasive particle.